DOT/FAA/AM-98/8

Office of Aviation Medicine
Washington, D.C. 20591

Differential Training Needs and Abilities at Air Traffic Control Towers: Should All Controllers Be Trained Equally?

Richard C. Thompson
Rebecca A. Agen
Dana M. Broach

Civil Aeromedical Institute
Federal Aviation Administration
Oklahoma City, OK 73125

March 1998

Final Report

U.S. Department of Transportation

Federal Aviation Administration

NOTICE

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
DOT/FAA/AM-98/8		

4. Title and Subtitle	5. Report Date
Differential Training Needs and Abilities at Air Traffic Control Towers: Should All Controllers Be Trained Equally?	March 1998
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
Thompson, R.C., Agen, R.A., and Broach, D.M.	
9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
FAA Civil Aeromedical Institute P.O. Box 25082 Oklahoma City, OK 73125	
	11. Contract or Grant No.
12. Sponsoring Agency name and Address	13. Type of Report and Period Covered
Office of Aviation Medicine Federal Aviation Administration 800 Independence Avenue, S. W. Washington, DC 20591	
	14. Sponsoring Agency Code
15. Supplemental Notes	

16. Abstract

The present study uses job elements identified by subject-matter experts to assess the perceived training needs of air traffic control specialists (ATCSs) who are assigned to towers after successful completion of FAA Academy training. The Director of Air Traffic Services tasked The Air Traffic Resource Management Program (ATX) with conducting a training needs assessment. To measure the needed skills and knowledge of new controllers, a survey was developed by ATX and distributed by the Civil Aeromedical Institute to 172 tower level III, IV, and V facility managers and nine regional Air Traffic Division managers. The survey was used to assess the performance-based skills standards needed by new controllers at the time of entry into a field facility. The training capability of individual towers was also examined. The results indicated that there are some differences in the required training of ATCSs assigned to level IV and V towers. Therefore, the tower assignment of new hires should be identified upon entry into the Academy to better focus on the specific training needs of prospective towers.

17. Key Words	18. Distribution Statement
Air Traffic Control Specialists, Training Needs	Document is available to the public through the National Technical Information Service, Springfield, VA 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
UNCLASSIFIED	UNCLASSIFIED	17	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

Differential Training Needs and Abilities at Air Traffic Control Towers: Should All Controllers Be Trained Equally?

Over the next two decades, the Federal Aviation Administration (FAA) will be required to replace the bulk of the air traffic control specialist (ATCS) workforce (Schroeder, Broach, & Farmer, 1997). The large-scale replacement of controllers will occur within the context of reduced resources available for selection, training, and deployment. In addition, the agency is planning to introduce new air traffic control and management technologies within the National Airspace System (NAS), theoretically requiring different knowledge, skills, and abilities (KSAs) as compared with those of the present controller workforce (Schroeder, et al., 1997).

In anticipation of an influx of new hires and the prospect of increased training demands with reduced resources, the FAA is redesigning its ATCS training systems and processes at air traffic control (ATC) facilities (Wickens, Mavor, & McGee, 1997). One element of that redesign is an overall reexamination of the training requirements and capabilities of field facilities. This study investigated the training requirements and capabilities for ATC facilities at the nation's busier airports, known as terminals. The needs assessment focused on two questions: (a) what are the knowledge, skills, and abilities (KSAs) required of new hire ATCS (developmentals) to begin on-the-job training (OJT) and (b) what are the facility's capabilities to provide training on those KSAs for developmentals. This paper details the assessment of the perceived training needs of, and the capability to provide OJT at level III, IV, and V towers.

Air Traffic Control Background

Terminal facilities provide ATC services at and around airports; air route traffic control centers (ARTCCs, or "centers") provide those services between airports. Approximately 40% of the 17,000 current controllers are assigned to 473 FAA terminal facilities. These terminal controllers have undergone a rigorous selection and training program before being certified as "full-performance level" (FPL) controllers. Initial training is currently conducted at the FAA Academy in Oklahoma City, OK. The bulk of a controller's training, however, is provided at the field facility. Facility training begins with classroom instruction followed by work in simulators. The content of the simulator-based training is tied to the facility's area of responsibility and operating procedures. Final training is accomplished with live traffic on the deck of the tower, or floor of the radar room, under the careful and extremely close supervision and instruction of a seasoned full-performance level controller.

The OJT in terminal facilities is based on the positions that a controller will operate during a shift. Depending on the volume of traffic, runway layout, and facility equipment configuration, each terminal is organized into several control positions, each with distinct responsibilities in the maintenance of the safe, orderly, and expeditious flow of air traffic into and out of an airport. The major positions are: clearance delivery; flight data, ground control, local control, and radar control. These positions are described in the FAA's Operational Position Standards (FAA, 1989). The clearance delivery and flight data positions receive, process, and disseminate flight plan information within the tower cab. The ground controller manages the airport taxiways and the planes moving to and from the active runways. The local controller manages the arrivals and departures from the active runways of the airport and from aircraft operating within a predetermined (usually 5 nautical miles) visual distance of the airport. Finally, the radar controller, working in either a room at the base of the tower or sometimes in a building located elsewhere in the metropolitan area, manages the airspace around the airport out to a specified distance beyond the visual range of the tower cab. The radar controller issues speed, heading, and altitude instructions known as (clearances) to the departing and arriving aircraft within that terminal's control area.

Due to differences in air traffic density, runway layouts, and facility equipment, the FAA groups terminals into different levels for staffing purposes. Terminal levels are determined by air traffic density factors. Density factors are calculated by summing the total number of air traffic operations for the busiest 183 days during the previous 12-month period. The sum is then divided by 183 to obtain an average number of operations. The average is then divided by 16 (to avoid penalizing non-24-hour terminals and towers with reduced traffic during the midnight shift) to obtain the density factor. Level III terminals have density factors ranging from 20 to 59.99 operations per hour; level IV towers have density factors ranging from 60 to 99.99 operations per hour; and level V towers have density factors greater than 100 operations per hour.

These differences in air traffic density, airport layouts, and facility equipment configurations potentially result in different knowledge, skill, and ability requirements for developmentals among terminal levels. Different KSA requirements suggest a need for different training programs. One purpose of this study was to examine the degree to which KSA requirements differed among terminal levels at the nation's busiest airports. The patterns of differences and similarities in KSA requirements among terminal levels would aid in identifying generic versus facility-specific training requirements to support the continued redesign of the ATCS training system.

Given generic versus facility-specific training requirements, the reengineering question then becomes the capabilities of the facilities to deliver training on those KSAs. The second purpose of this study, therefore, was to examine the degree to which facilities differed in their capability to provide training on the required KSAs. This analysis would identify gaps in training capabilities by facility level, and their needs for additional resources required to improve the training capabilities of the terminals.

METHOD

Participants

A survey was mailed to 172 level III, IV, and V terminal facility managers and regional air traffic (ATS-500) managers. The Air Traffic Initial Qualifications Standards Work Group determined which terminals would be surveyed. One hundred eight (108) surveys were returned, for a 60% return rate. Of the respondents indicating their facility level (seven did not), 62% were level III terminals, 20% were level IV terminals, and 18% were level V terminals. Appendix A provides an analysis of the sample and respondents. Regional ATS-500 managers were not identified (for anonymity reasons).

Measures

The survey (see Appendix B) consisted of 191 items grouped into 13 different dimensions or categories assessing specific knowledge, skills, and abilities of air traffic control specialists. These dimensions were identified by subject-matter experts as important components of an ATCS position. The subject-matter experts consisted of headquarters, FAA Academy, and field personnel from the En Route Air Traffic Initial Qualifications Standards Work Group. Each of the 13 dimensions is briefly described below. Each dimension and the specific items that comprised the dimension are found in Appendix B.

1. **National Certifications.** Assesses the need for developmentals to have four types of national certification at the time of reporting to the tower.
2. **Human Factors in ATC.** Assesses teamwork skills required by ATCSs to function effectively in unusual circumstances when higher levels of intercontroller coordination are necessary.
3. **Hearback/Readback.** Assesses the developmentals' ability to accurately communicate with the pilot and other ATCSs.
4. **ATC Technique.** Assesses the developmentals' need to understand correct behaviors associated with controlling aircraft during standard operations.
5. **Implications of Significant Weather.** Examines the need for developmentals to understand weather radar and the consequences of adverse weather conditions.
6. **Understanding the Pilot's Environment.** Assesses the developmentals' knowledge of aviation from the pilot's perspective.
7. **ATC Equipment.** Examines the developmentals' knowledge of radar and information-gathering devices that may be available, for example DBRITE radar.
8. **Tower Cab.** Assesses KSAs necessary to function effectively in a tower cab environment.
9. **Nonradar.** Assesses the developmentals' need to know how to control and track aircraft without radar support.

10. **Unusual Situations.** Examines behaviors needed when a mishap or accident occurs.
11. **Radar Training.** Examines the developmentals' knowledge associated with the effective use of radar.
12. **Academy Simulation Training.** Assesses the developmentals' need for simulator exposure to tower level III, IV, and/or V aircraft volume and complexity.
13. **Developmental Training.** Assesses general computer skill requirements.

Procedures To assess the specific KSAs within each category (see Appendix B) terminal level III, IV, and V managers were asked to indicate if developmentals should have each skill upon arriving at the facility. In addition, the managers were asked if the facility currently had the ability to provide OJT for each KSA, regardless of perceived need. Dimension scores were the proportion of "yes" responses across all items within a dimension.

To determine if differences existed in the training needs and the ability to train KSAs at level III, IV, and V towers, *yes* and *no* responses were assessed with non-parametric chi-square analyses. To reduce the number of statistical tests and to provide more stable estimates of differences, tests of significance were conducted only for categories or dimensions. This procedure better controlled the study-wise error rate but decreased the specificity of the analyses.

RESULTS

The survey results, and any significant differences among towers are summarized in Tables 1 and 2. Table 1 shows the percentage of facility managers who indicated developmentals need the KSAs when reporting to a facility. Table 2 shows the percentage of facility managers who indicated that they had the ability to provide OJT for each category of KSAs.

Table 1. Percentage of Respondents Endorsing KSA Dimension as Needed at Time of Entry Into Field Training (by Facility Level)

	Terminal Level			
KSA Dimension	III	IV	V	Chi-Square
National Certifications	77%	70%	78%	2.10
Human Factors in ATC	85%	83%	94%	6.56*
Hearback/Readback	94%	95%	89%	3.93
ATC Technique	85%	88%	87%	0.52
Implications of Significant Weather	88%	93%	94%	3.14
Understanding the Pilot's Environment	72%	76%	84%	7.30*
ATC Equipment	58%	58%	66%	3.55*
Tower Cab	82%	83%	86%	1.88
Nonradar	67%	68%	82%	13.12**
Unusual Situations	77%	69%	79%	2.99
Radar Training	77%	89%	85%	26.92***
Academy Simulation Training	42%	56%	67%	10.92**
Developmental Training	50%	46%	47%	0.40

* $p<.05$, ** $p<.01$, *** $p<.001$

Table 2. Percentage of Respondents Indicating that Terminal has the Capability to Deliver Training on KSA Dimensions by Facility Level

	Terminal Level			
KSA Dimension	III	IV	V	Chi-Square
National Certifications	82%	81%	73%	34.64***
Human Factors in ATC	36%	21%	30%	7.77*
Hearback/Readback	85%	86%	84%	0.17
ATC Technique	82%	84%	88%	1.94
Implications of Significant Weather	78%	74%	83%	2.48
Understanding the Pilot's Environment	59%	43%	50%	11.10**
ATC Equipment	62%	75%	82%	31.62***
Tower Cab	85%	96%	79%	33.35***
Nonradar	85%	87%	69%	21.94***
Unusual Situations	88%	78%	75%	9.35**
Radar Training	82%	89%	70%	37.89***
Academy Simulation Training	42%	68%	59%	14.03***
Developmental Training	73%	70%	73%	0.33

* $p<.05$, ** $p<.01$, *** $p<.001$

Nonradar and Radar Training are two dimensions where level V managers indicated a strong need for the developmental to have skills when arriving at the facility but these managers do not have the ability to provide that training (see Tables 1 & 2). All tower levels indicated a low ability to train for Human Factors in ATC, with level IV managers reporting the lowest ability (21%) to train for this dimension $\chi^2(2)=7.77$, $p<.05$. Similarly, all levels, especially level V towers, reported a need for the developmental to possess an understanding of the pilot's environment (84%), $\chi^2(2)=7.30$, $p<.05$. However, all levels indicated a low ability to train in this area, with level IV showing the lowest ability (43%), $\chi^2(2)=11.10$, $p<.01$.

With regard to National Certifications, Unusual Situations, and Tower Cab, there were no significant differences among tower levels in the need for these KSAs when developmentals were reporting to a tower; over two-thirds of all facility managers indicated that developmentals receive these dimensions of training. There were differences in the ability to train for these dimensions, however. Specifically, level V towers indicated significantly less ability to provide training directed towards National Certifications (73%), compared with level IV (81%) and level III (82%), which did not differ from each other. Also, more level III towers indicated an ability to provide training in unusual situations, compared with level IV and level V towers. Finally, level IV towers indicated the greatest need for Tower Environment training (96%), compared with level III (85%) and level V (79%) towers.

Figure 1 summarizes the results of the significance tests in the form of a 2x2 contingency table. Figure 1 shows four patterns of results. The results for each combination of needs for KSAs and the ability to train are discussed next.

Cell 1 of Figure 1 shows that significant differences did occur among tower levels for both the skills needed upon arrival at the facility and the ability of tower levels to provide training for the following dimensions: Human Factors in ATC, Understanding

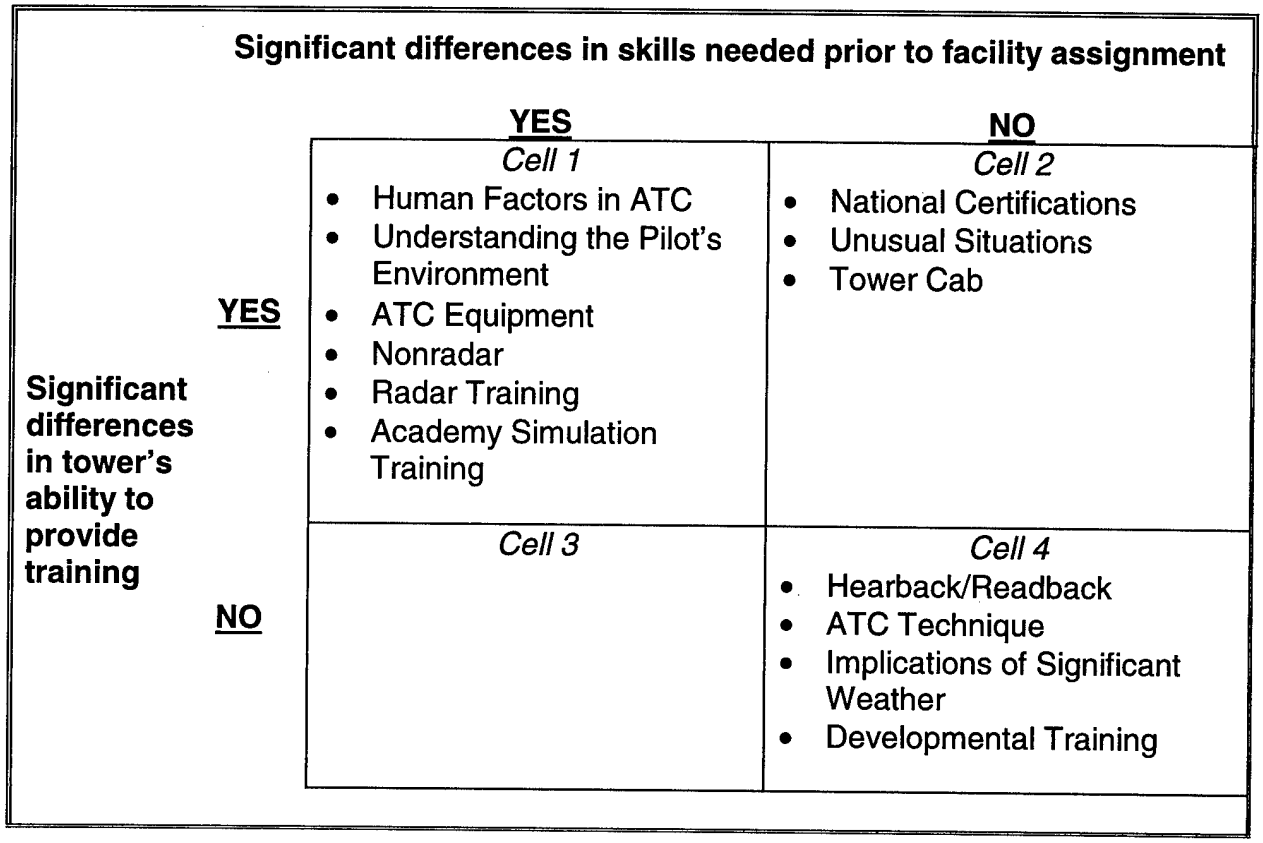

Figure 1. Pattern of Survey Outcomes: Significant Differences Between Tower Levels

the Pilot's Environment, ATC Equipment, Nonradar, Radar Training, and Academy Simulation (see Tables 1 & 2). Cell 2 indicates standard skills that developmentals should have upon arrival; yet, some towers cannot provide this training. Therefore, these skills should be added to the existing tower curricula, and additional training resources provided based on the tower's present ability to provide such training. There were no KSAs that fell into Cell 3 of Figure 1. This finding indicates that there are few KSAs that cannot be differentially trained by the tower levels. The presence of KSAs in cell 3 would indicate there were important skills that must be trained at the Academy for all developmentals, regardless of tower level. Cell 4 of Figure 1 shows that, for Hearback/ Readback, ATC Technique, Implications of Significant Weather, and Developmental Training (see Tables 1 & 2), there are no significant differences among tower levels in the perceived need for the KSAs when developmentals arrive at the facility and the towers are able to provide training for the KSAs. Therefore, regardless of tower level, developmentals need similar levels of training in these KSAs, and tower levels do not differ in their ability to provide training.

DISCUSSION

The present study provides an initial examination of the training needs and abilities of levels III, IV, and V towers. The results suggest that, for about half of the skill categories, the ATCS training needs perceived by facility managers are about the same. However, for those areas (i.e., Human Factors in ATC, Understanding the Pilot's Environment, ATC Equipment, Nonradar, Radar Training, and Academy Simulation) where differences in training needs do exist, the KSAs are needed less often in level III towers (nonradar, radar training, and Academy simulations) or both level III and IV towers (Emergency ATC situations, Pilot environment, and Equipment).

The ability of different level towers to provide training for sets of skills varies widely. For example, only one third or fewer, facility managers indicated that they could provide training for emergency ATC situations. However, level III towers could provide this training more often than level V; level IV towers were least able to provide this training. The limited ability to deliver this training suggests that it should be provided by the Academy. Similarly, only about half of all facilities could provide training to enhance the developmental's Understanding of the Pilot's Environment, indicating that it, too, should be delivered by the Academy. On the other hand, compared with levels III and IV towers, level V towers were better able to provide training on a variety of equipment, perhaps due to a greater availability of newer technology at these towers. In general, level IV towers indicated more ability to train for tower-specific skills (Nonradar, Radar Training, ATC Equipment) and indicated a higher need for simulator experience than did levels III and V towers. Level III towers appeared better able to provide non-tower-specific training, such as National Certifications, Understanding the Pilot's Environment, and Unusual Situations. Taken as a whole, these results suggest that some training should be delivered to some developmentals at the tower instead of at the Academy. Others KSAs, such as Emergency Situation Training and the Understanding the Pilot's Environment, should be delivered by the Academy. Finally, some training, such as exposure to levels IV and V difficulty, is not needed by over half of level III towers and could be eliminated or reduced from the program of training for developmentals who will report to those towers, while being retained for others.

These findings suggest that it may be useful to conduct additional, more detailed analyses assessing the viability of such training options. This study focused solely on the perceptions of facility managers. While this is useful information, curriculum changes based solely on the perceptions of facility managers would be unjustified. Instead, research should also examine the perceptions of both working controllers and supervisors. Working controllers and supervisors are more familiar with the actual work that is performed and the requisite KSAs needed. The perceptions of these groups could differ substantially from those of facility managers examined in the present study. Additional research should also examine the cost/benefits of training effectiveness, contrasting OJT, the FAA Academy, and the Collegiate Training Initiative (CTI) graduates. Additional inquiries will help clarify the changes required and provide an improved basis for identifying the cost benefits of Academy versus field facility training.

REFERENCES

FAA. (1989). *Operational Positions Standards.* (FAA Order 7220.2A). Washington DC: FAA Air Traffic Operation Services.

Schroeder, D.J., Broach, D., & Farmer, W.L. (1997). *Current FAA Controller Workforce Demographics, Future Requirements, and Research Questions.* Paper presented at the Ninth Annual International Aviation Psychology Symposium, April 28-May 1, Columbus, Ohio.

Wickens, C.D., Mavor, A.S., & McGee, J.P. (1997). *Flight to the Future, Human Factors in Air Traffic Control.* Washington, DC: National Academy Press.

APPENDIX A

Survey Distribution and Return Rates by Region and Facility Level

Region	Facility Level III	IV	V	ATS-500	Total
	Surveys Distributed				
Alaskan	0	1	0	1	2
Central	5	1	1	1	8
Eastern	14	5	4	1	24
Great Lakes	23	8	1	1	33
New England	5	2	0	1	8
Northwest Mt.	12	2	0	1	15
Southern	28	7	5	1	41
Southwest	20	3	1	1	25
Western-Pacific	16	5	3	1	25
Total	123	34	15	9	181
	Surveys Returned				
Alaskan	0	0	0	*	0
Central	5	0	1	*	6
Eastern	9	1	3	*	13
Great Lakes	14	5	1	*	20
New England	3	2	0	*	5
Northwest Mt.	5	0	2	*	7
Southern	10	5	5	*	20
Southwest	9	4	2	*	15
Western-Pacific	8	3	4	*	15
Total	63	20	18	7	108

Note: Regional ATS-500 managers were not assessed due to the small number of respondents. Respondents are not identified due to anonymity concerns.

APPENDIX B

Results of Air Traffic Initial Qualifications Standards Survey

	Upon arriving at your facility, developmentals must have this skill. % Yes				Regardless of need, do you currently have the ability to provide this training? % Yes			
	Tower 3	Tower 4	Tower 5	Overall TWR 3-5	Tower 3	Tower 4	Tower 5	Overall TWR 3-5
NATIONAL CERTIFICATIONS								
Without references, the developmental should be able to successfully complete the following National Certification:								
1. DBRITE	78	74	94	**79**	93	95	89	**91**
2. LAWRS	63	60	39	**58**	78	75	41	**72**
3. Radar Qualifications	79	68	83	**77**	73	75	78	**74**
4. CTO	89	79	94	**86**	83	80	83	**81**
National Certifications Summary*	**77**	**70**	**78**	**75**	**82**	**81**	**73**	**79**
HUMAN FACTORS IN ATC								
Given an unusual or emergency ATC situation (e.g., aircraft accident, aircraft incident, runway incursion), the developmental should possess teamwork skills that include:								
5. Good Communication and Coordination	95	95	94	**96**	66	45	56	**60**
6. Managing Interpersonal Conflict	89	80	100	**89**	26	10	17	**21**
7. Problem Solving	94	85	100	**94**	34	20	33	**31**
8. Managing Resources or Being a Resource	68	70	83	**73**	36	20	35	**32**
9. Managing Stress	81	85	94	**86**	16	10	11	**14**
Human Factors in ATC Summary*	**85**	**83**	**94**	**88**	**36**	**21**	**30**	**32**
Given a standard ATC scenario, the developmental should possess the ability to detect Hearback/Readback errors such as:								
10. Transponder Codes	94	95	89	**93**	85	90	83	**87**
11. Headings	94	95	89	**94**	85	85	83	**86**
12. Call Signs	94	95	89	**94**	85	85	83	**86**
13. Altitude Assignments	95	95	89	**95**	85	85	83	**86**
14. Clearances	95	95	89	**95**	85	85	89	**87**
Hearback/Readback Summary*	**94**	**95**	**89**	**94**	**85**	**86**	**84**	**86**

* Summary scores indicate the percent of "yes" responses calculated for all the items in a category.

	Upon arriving at your facility, developmentals must have this skill. % Yes				Regardless of need, do you currently have the ability to provide this training? % Yes			
	Tower 3	Tower 4	Tower 5	Overall TWR 3-5	Tower 3	Tower 4	Tower 5	Overall TWR 3-5
During standard ATC scenarios, the developmental should possess good technique in, but not limited to:								
15. Scanning	91	90	89	**90**	87	95	89	**88**
16. Vectoring	71	80	78	**74**	80	90	89	**83**
17. Coordination	87	90	83	**88**	89	95	100	**92**
18. Memory Joggers	86	85	89	**87**	77	70	83	**77**
19. ATC Speech Pattern	92	95	94	**94**	75	70	78	**76**
ATC Technique Summary*	**85**	**88**	**87**	**87**	**82**	**84**	**88**	**83**
IMPLICATIONS OF SIGNIFICANT WEATHER								
Without references, the developmental should be able to define and recognize the implications of significant weather to air traffic, such as:								
20. SIGMETS	92	95	94	**93**	81	85	89	**84**
21. AIRMETS	91	90	94	**91**	81	80	83	**82**
22. Micro Burst	84	90	94	**88**	68	65	78	**69**
23. Icing	87	95	94	**90**	83	65	83	**80**
Implications Of Significant Weather Summary*	**88**	**93**	**94**	**90**	**78**	**74**	**83**	**79**
UNDERSTANDING THE PILOT'S ENVIRONMENT								
Without references, the developmental should possess a knowledge of:								
24. Aircraft Types	97	95	94	**96**	85	70	78	**83**
25. Performance Characteristics	94	90	94	**93**	79	63	72	**76**
26. Flight Management Systems	48	75	78	**59**	31	15	33	**27**
27. Aircraft Instrumentation	65	65	77	**67**	38	20	29	**33**
28. GPS	66	75	83	**71**	54	35	44	**48**
29. Free Flight	50	55	72	**56**	41	30	28	**36**
30. TCAS Understanding and Obligations	84	75	89	**83**	85	70	67	**76**
Understanding The Pilot's Environment Summary*	**72**	**76**	**84**	**75**	**59**	**43**	**50**	**54**

* Summary scores indicate the percent of "yes" responses calculated for all the items in a category.

During standard ATC scenarios, the developmental should possess good technique in, but not limited to:	Upon arriving at your facility, developmentals must have this skill. % Yes				Regardless of need, do you currently have the ability to provide this training? % Yes			
	Tower 3	Tower 4	Tower 5	Overall TWR 3-5	Tower 3	Tower 4	Tower 5	Overall TWR 3-5
ATC EQUIPMENT								
The developmental should understand and be able to operate the following equipment:								
31. ATIS	87	75	78	**82**	93	95	94	**94**
32. ASDE	23	25	44	**28**	23	35	67	**31**
33. RADAR	69	75	83	**72**	75	84	94	**81**
34. DBRITE	80	78	78	**79**	90	90	89	**89**
35. NAVAIDS Monitoring/Switching Equipment	64	55	56	**60**	82	90	89	**83**
36. ACE/SAIDS	49	45	59	**50**	50	70	82	**56**
37. TDLS	36	50	67	**44**	33	65	89	**45**
38. ICSS or Replacement	74	70	67	**72**	72	80	89	**75**
39. ASOS	71	70	67	**69**	74	90	61	**72**
40. TDWR	28	40	61	**38**	23	50	67	**34**
Equipment Summary*	**58**	**58**	**66**	**59**	**62**	**75**	**82**	**66**
TOWER CAB								
Given a simulated tower environment, the developmental should be able to manage:								
41. Coordination	89	85	89	**88**	84	95	78	**86**
42. Keyboard Entries	80	85	83	**83**	87	100	83	**90**
43. Position Relief Checklist	90	90	89	**90**	87	100	83	**90**
44. Timely Transfer of Control	82	75	83	**82**	87	90	78	**87**
45. Stripmarking	90	85	94	**89**	87	100	89	**91**
46. Understanding Additional VFR Services	87	80	78	**84**	87	100	83	**90**
47. Scanning	89	85	89	**88**	84	95	72	**85**
48. Speed Control	69	75	78	**71**	84	95	72	**82**
49. Sequencing (Establish and Control)	70	85	83	**75**	85	90	78	**84**
50. Loss of ARTS	69	74	83	**73**	82	100	72	**84**
51. Loss of DBRITE	74	74	83	**76**	84	100	72	**86**
52. Braking Action Reports	82	85	89	**84**	85	90	83	**87**
53. Wake Turbulence	92	95	89	**92**	87	95	83	**89**
Tower Cab Summary*	**82**	**83**	**86**	**83**	**85**	**96**	**79**	**87**

* Summary scores indicate the percent of "yes" responses calculated for all the items in a category.

		Upon arriving at your facility, developmentals must have this skill. % Yes				Regardless of need, do you currently have the ability to provide this training? % Yes			
		Tower 3	Tower 4	Tower 5	Overall TWR 3-5	Tower 3	Tower 4	Tower 5	Overall TWR 3-5
During standard ATC scenarios, the developmental should possess good technique in, but not limited to:									
NONRADAR									
Given a nonradar situation, the developmental should be able to manage:									
54.	Arrivals	67	65	78	**69**	87	80	56	**80**
55.	Departures	68	65	78	**70**	87	80	56	**80**
56.	Transition from Radar to Nonradar	57	55	83	**63**	83	85	78	**82**
57.	Transition back to Radar	59	55	83	**64**	84	90	78	**84**
58.	Transition to CENRAP	52	70	78	**60**	73	90	61	**73**
59.	Loss of ARTS	67	70	83	**71**	84	95	78	**84**
60.	Issuing Clearances	86	80	89	**84**	92	85	78	**88**
61.	Stripmarking	76	85	83	**79**	92	90	72	**88**
Nonradar Summary*		**67**	**68**	**82**	**70**	**85**	**87**	**69**	**82**
UNUSUAL SITUATIONS									
Given an unusual or emergency ATC situation (e.g., aircraft accident, aircraft incident, runway incursion), the developmental should have appropriate responses to the following:									
62.	Operational Errors	73	60	78	**71**	89	80	72	**85**
63.	Aircraft Mishaps	75	65	78	**73**	86	70	78	**82**
64.	Equipment Failure (Communications, Radar)	83	85	89	**83**	87	85	78	**86**
65.	Pilot Deviations/Runway Incursion	78	65	72	**74**	89	75	72	**84**
Unusual Situations Summary*		**77**	**69**	**79**	**75**	**88**	**78**	**75**	**84**

* Summary scores indicate the percent of "yes" responses calculated for all the items in a category.

		Upon arriving at your facility, developmentals must have this skill. % Yes				Regardless of need, do you currently have the ability to provide this training? % Yes			
		Tower 3	Tower 4	Tower 5	Overall TWR 3-5	Tower 3	Tower 4	Tower 5	Overall TWR 3-5
During standard ATC scenarios, the developmental should possess good technique in, but not limited to:									
RADAR TRAINING									
Given a simulated RADAR environment, the developmental should be able to manage:									
66.	Issuing Clearances	90	95	89	**90**	85	85	72	**83**
67.	Merging Target Procedures	84	90	89	**86**	85	85	67	**81**
68.	Speed Control	69	85	83	**76**	82	85	61	**77**
69.	Sequencing using Vector vs Speed Control	73	85	83	**76**	80	85	61	**76**
70.	Sequencing (Establish and Control)	72	85	83	**77**	81	85	67	**78**
71.	Vectoring to Intersecting Runways	61	80	67	**66**	72	85	56	**70**
72.	Vectoring to Parallel Runways	45	75	78	**57**	57	80	61	**60**
73.	Coordination	81	95	89	**85**	85	95	72	**84**
74.	Keyboard Entries	76	95	83	**81**	84	95	72	**83**
75.	Position Relief Checklist	86	90	89	**87**	85	100	78	**86**
76.	Timely Transfer of Control	82	90	83	**83**	84	95	72	**83**
77.	Stripmarking	81	95	89	**84**	85	90	78	**84**
78.	Additional Services	81	90	83	**82**	85	95	78	**85**
79.	Scanning	81	95	89	**85**	84	90	67	**80**
80.	Traffic and Safety Alerts	87	95	89	**88**	85	90	78	**84**
81.	Wake Turbulence	86	90	89	**87**	85	90	78	**84**
Radar Training Summary*		**77**	**89**	**85**	**81**	**82**	**89**	**70**	**80**
ACADEMY SIMULATION TRAINING									
The developmental should have the following simulation experience:									
82.	Exposed to Level III Volume and Complexity.	86	89	89	**85**	87	89	53	**79**
83.	Exposed to Level IV Volume and Complexity.	29	65	67	**44**	24	85	56	**40**
84.	Exposed to Level V Volume and Complexity.	9	12	44	**17**	10	28	67	**23**
Academy Simulation Training Summary*		**42**	**56**	**67**	**49**	**42**	**68**	**59**	**48**

* Summary scores indicate the percent of "yes" responses calculated for all the items in a category.

	Upon arriving at your facility, developmentals must have this skill. % Yes				Regardless of need, do you currently have the ability to provide this training? % Yes			
	Tower 3	Tower 4	Tower 5	Overall TWR 3-5	Tower 3	Tower 4	Tower 5	Overall TWR 3-5
During standard ATC scenarios, the developmental should possess good technique in, but not limited to:								
The developmental should have the following:								
85. Facility specific knowledge.	19	15	6	**15**	98	100	94	**98**
86. Briefed and participated in an interactive discussion covering various employee orientation topics, such as conduct and discipline, employee assistance, pay and benefits, etc.	94	95	89	**93**	82	55	77	**78**
87. Completed OJTI course.	44	30	56	**43**	59	80	71	**65**
88. Skills in MS Windows and MS Word to perform such functions as file opening and closing, editing, formatting, etc.	43	45	33	**43**	54	45	47	**50**
Developmental Training Summary*	**50**	**46**	**47**	**49**	**73**	**70**	**73**	**73**

89. When do you believe RTF training should be completed?

Tower 3 % Yes			Tower 4 % Yes			Tower 5 % Yes			Overall Towers 3-5 % Yes		
Initial Academy	Field	Academy Follow-up	Initial Academy	Field	Academy Follow-up	Initial Academy	Field	Academy Follow-up	Initial Academy	Field	Academy Follow-up
45	15	40	45	5	50	47	24	29	**46**	**16**	**38**

* Summary scores indicate the percent of "yes" responses calculated for all the items in a category.

☆U.S. GOVERNMENT PRINTING OFFICE: 1998 - 660-088/60061